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NURBS-enhanced maximum-entropy schemes

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Abstract

In this paper, we combine high order local maximum-entropy schemes (HOLMES) with the integration framework developed in the NURBS-enhanced finite element method (NEFEM). We focus on the two-dimensional case where, given a domain described by some NURBS curves, a meshless formulation based on the HOLMES approximants is employed for the discretization and, at the same time, the geometric fidelity given by the NURBS boundary is preserved thanks to the NEFEM integration. Since HOLMES basis functions are not interpolatory on the boundary, different techniques are considered for the imposition of essential boundary conditions. The efficiency and the accuracy of the proposed methodology are confirmed with supportive numerical examples.

Keywords: maximum-entropy; meshless; high order; NURBS-enhanced FEM

1. Introduction

Several attempts have been made over the last few years to seek a tighter integration between Computer Aided Design (CAD) and numerical analysis, often referred to as CAE (Computer Aided Engineering). Two major contributions in this direction are represented by isogeometric analysis (IGA)[1, 2] and the NURBS-enhanced finite element method (NEFEM) [3, 4, 5].

The key idea of IGA is to employ the same basis functions of the CAD description also in the numerical analysis. In the original version of IGA, these basis functions are non uniform rational B-splines (NURBS) [6], which is the standard methodology employed in CAD systems. Unfortunately, the

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